Attorney's Docket No.: 08935-035004 / M-4746C

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Douglas J. Woodnorth et al. Art Unit :
Serial No. : Examiner :
Filed : May 22, 2002
Title : BATTERY CATHODE

Commissioner for Patents
Washington, D.C. 20231

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PETITIONS OFFICE

PRELIMINARY AMENDMENT

Prior to examination, please amend the application as follows:

In the specification:

On page 1 of the specification, before line 1, insert

--This application is a continuation of U.S. application serial no. 09/378,324, filed August 20, 1999, which is a continuation-in-part of U.S. application serial no. 09/001,822, filed December 31, 1997, abandoned.--

In the claims:

Cancel claims 1-16.

Add claims 17-26.

--17. (New) A method of making an electrochemical cell, comprising constructing an electrochemical cell including a housing and, within the housing, (1) a cathode comprising manganese dioxide and at most 10% by weight graphite particles having an average particle size of less than 20 microns that were prepared without using an industrial or laboratory graphitization process and without any industrial or laboratory expansion process; (2) an anode comprising zinc particles and a gassing

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Leroy Jenkins
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inhibitor selected from the group consisting of bismuth, tin, and indium; (3) a separator disposed between the cathode and the anode; and (4) an alkaline electrolytic solution.

18. (New) The method of claim 17, wherein the graphite particles have an average particle size of less than about 12 microns.

19. (New) The method of claim 17, wherein the graphite particles have an average size of from about 2 microns to about 12 microns.

20. (New) The method of claim 17, wherein the graphite particles have an average size of from about 5 microns to about 9 microns.

21. (New) The method of claim 17, wherein the separator comprises a first nonwoven, non-membrane material and a second nonwoven, non-membrane material disposed along a surface of the first nonwoven, non-membrane material.

22. (New) the method of claim 17, wherein the cathode has a porosity of from about 24% to about 28%.

23. (New) The method of claim 17, wherein the anode has a porosity of from about 2 grams of zinc particles to about 2.45 grams of zinc particles per cubic centimeter of anode volume.

24. (New) The method of claim 17, wherein a weight ratio of the manganese dioxide to the electrolytic solution is from about 2.4 to about 2.9.

25. (New) The method of claim 17, wherein the weight ratio of the zinc particles to the electrolytic solution is from about 0.9 to about 1.25.

26. (New) The method of claim 17, wherein the cathode further comprises a binder.--

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REMARKS

Applicants have substituted method claims 17-26 for product claims 1-3 and 5-16 to remove the product by process issue raised by the Examiner in the Office Action dated May 23, 2001 in the parent application. Applicants also have put the definition of non-synthetic and non-expanded from page 1 of the specification into the claims.

Prior to sometime in the 1970's, Duracell marketed alkaline electrochemical cells including a manganese dioxide cathode including non-synthetic, non-expanded graphite particles and a zinc anode including mercury as the gassing inhibitor. When efforts were made to remove mercury from the anode and substitute other gassing inhibitors, it was found that significant gassing occurred. This in part was because the non-synthetic graphite used in the cathode included natural impurities that led to gassing. As a result, the mercury-free cells that were subsequently introduced included synthetic graphite particles in the cathode. See the Declaration of James Cervera.

Claim 17 specifies that the anode include a gassing inhibitor selected from the group consisting of bismuth, tin, and indium. These gassing inhibitors were not used in the cells marketed by Duracell prior to the 1970's discussed above. Claim 17 also requires that the cathode include non-synthetic, non-expanded graphite particles having a particle size under 20 microns. A person of ordinary skill in the art would not have been motivated to incorporate non-synthetic graphite particles generally into the cathode because such particles previously had been found to cause gassing problems.

Jose, the reference cited by the Examiner and the basis for the 35 U.S.C. § 103(a) rejection, does not suggest (or even mention) non-synthetic, non-expanded graphite particles. As a result, claims 17-26 would have been obvious in view of Jose.

Attached is a marked-up version of the changes being made by the current amendment.

Applicants ask that all claims be allowed. Please apply any other charges or credits to Deposit Account No. 06-1050.

Respectfully submitted,

Date: 5/22/02

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Version with markings to show changes made

In the specification:

On page 1 of the specification, before line 1, insert

--This application is a continuation of U.S. application serial no. 09/378,324, filed August 20, 1999, which is a continuation-in-part of U.S. application serial no. 09/001,822, filed December 31, 1997, abandoned.--

In the claims:

Claims 1-16 have been cancelled.

Claims 17-27 have been added as follows:

--17. (New) A method of making an electrochemical cell, comprising

constructing an electrochemical cell including a housing and, within the housing, (1) a cathode comprising manganese dioxide and at most 10% by weight graphite particles having an average particle size of less than 20 microns that were prepared without using an industrial or laboratory graphitization process and without any industrial or laboratory expansion process; (2) an anode comprising zinc particles and a gassing inhibitor selected from the group consisting of bismuth, tin, and indium; (3) a separator disposed between the cathode and the anode; and (4) an alkaline electrolytic solution.

18. (New) The method of claim 17, wherein the graphite particles have an average particle size of less than about 12 microns.

19. (New) The method of claim 17, wherein the graphite particles have an average size of from about 2 microns to about 12 microns.

20. (New) The method of claim 17, wherein the graphite particles have an average size of from about 5 microns to about 9 microns.

21. (New) The method of claim 17, wherein the separator comprises a first nonwoven, non-membrane material and a second nonwoven, non-membrane material disposed along a surface of the first nonwoven, non-membrane material.

22. (New) the method of claim 17, wherein the cathode has a porosity of from about 24% to about 28%.

23. (New) The method of claim 17, wherein the anode has a porosity of from about 2 grams of zinc particles to about 2.45 grams of zinc particles per cubic centimeter of anode volume.

24. (New) The method of claim 17, wherein a weight ratio of the manganese dioxide to the electrolytic solution is from about 2.4 to about 2.9.

25. (New) The method of claim 17, wherein the weight ratio of the zinc particles to the electrolytic solution is from about 0.9 to about 1.25.

26. (New) The method of claim 17, wherein the cathode further comprises a binder.--